Speakers & Abstracts

Lily Childress

Lilian Childress received her B.A., M.S., and Ph.D. from Harvard University before joining the faculty at Bates College in the fall of 2007. Her research touches on aspects of quantum optics, atomic physics, and solid state physics, with an emphasis on tabletop experiments. In her spare time, she enjoys rock climbing, nordic skiing, and trying to teach her puppy Echo to spin.

The nitrogen-vacancy center: exploring spin dynamics in diamond

Isolated electronic and nuclear spins in condensed matter systems possess a quantum mechanical degree of freedom with exceptionally long coherence times; their narrow resonances have found applications ranging from noninvasive medical imaging devices to molecular structure determination. This talk will introduce spin systems and some of the techniques used to manipulate and measure them, focusing on observations of the electronic spin associated with the nitrogen-vacancy defect in diamond. The observed quantum mechanical properties of this electronic spin indicate that it could provide a sensitive probe of nanoscale magnetic fields or even a building block for future quantum information processing systems.

Meg Urry

Meg Urry is the Israel Munson Professor of Physics and Astronomy, Chair of the Physics Department, and Director of the Yale Center for Astronomy and Astrophysics. Her scientific research focuses on supermassive black holes in galaxies. Urry has published over 150 articles in scientific journals and is a Fellow of the American Academy of Arts and Sciences, the American Physical Society, and American Women in Science. She has served on the National Research Council's Space Studies Board and the Board on Physics and Astronomy, and co-chaired the NRC Committee on Astronomy and Astrophysics. She joined Yale in 2001 from her tenured position on the senior scientific staff at the Space Telescope Science Institute, which runs the Hubble Space Telescope for NASA. She did her undergraduate work at Tufts University and received her Ph.D. from Johns Hopkins University. Professor Urry is also known for her efforts to increase the number of women in the physical sciences.

Women in Physics: Why Aren't There More of Us?

Any woman in physics who looks at her work environment - lab, committees, department, colleagues - sees far more men than women. As scientists, what should we conclude from this overwhelming gender imbalance? Social scientists have demonstrated that the dearth of women does not reflect aptitude or even interest, but rather, the persistence of gender schemas. Social science experiments also offer guidance on strategies for mitigating unconscious bias. In any case, the necessary first step toward fully utilizing all the physics talent out there is to understand and adjust for this uneven playing field.

Sue Coppersmith

Dr. Susan Coppersmith is a Professor of Physics at the University of Wisconsin, Madison. She is a theoretical condensed matter physicist who has worked on a broad range of problems in the area of complex systems, and has made substantial contributions to the understanding of subjects

including glasses, granular materials, the nonlinear dynamics of magnetic flux lattices in type-II superconductors, and quantum computing. Dr. Coppersmith is a former Chair of the Physics Department at UW-Madison and has served on the International Advisory Board of Nordita, on the Mathematical and Physical Science Advisory Committee of the National Science Foundation, and as a Trustee at the Aspen Center Physics. She has served as Chair of the Division of Condensed Matter Physics of the American Physical Society, as Chair of the Board of Trustees of the Gordon Research Conferences, and as Chair of the External Advisory Board of the Kavli Institute for Theoretical Physics at the University of California, Santa Barbara. Dr. Coppersmith's accomplishments have been recognized by election to fellowship in the American Physical Society, the American Association for the Advancement of Science, and the American Academy of Arts and Sciences.

Understanding the Microarchitecture of Mother-of-Pearl

Nacre, or mother-of-pearl, is a layered biomineral composite that the lines the inside of some seashells. It is widely studied because of its self-assembled, efficient and accurately ordered architecture, its toughness, and its fascinating and poorly understood formation mechanisms.

I will argue that physics experimental techniques and theoretical methods can yield new insight into nacre formation mechanisms. In particular, the aragonite crystal tablets in nacre orient so that their c-axes are aligned perpendicular to the layers. I will present experimental and theoretical evidence that this order is established dynamically, via regulation of the kinetics of crystal nucleation and growth.

Kathryn Johnston

Kathryn Johnston is an Astrophysicist, interested in understanding how our own Galaxy formed. She pursues this goal using a combination of close collaborations with observational colleagues and computer simulations of galactic collisions. She arrived in this field following an undergraduate degree in mathematics from Cambridge University, a PhD in Astronomy and Astrophysics from UC Santa Cruz and a postdoctoral position at the Institute for Advanced Study in Princeton. She joined the Columbia Astronomy Faculty in Fall 2006, after spending 7 years as an assistant professor at Wesleyan University.

Galactic Cannibalism - you are what you eat?

Images of galaxies are often awe-inspiring - spirals of billions of stars spinning slowly in the sky. Yet these magical objects are thought to have formed quite violently through the agglomeration of smaller objects. It is possible that even our own home - the Milky Way galaxy - is a cannibal. In this talk we will look at the growing evidence that this is indeed the case.

Yung-Kee Kim:

Young-Kee Kim received her Ph.D. from the University of Rochester in 1990. She was a professor at the University of California at Berkeley and the University of Chicago before becoming the Deputy Director of Fermilab in 2003, a position she holds today. She was elected a Fellow of the APS in 2004 and won the Ho-Am Prize in 2005. In addition to her research, she serves as the PI of the National Science Foundation's REU program at the University of Chicago for Minorities and Women. She is a founding member of the Greater Chicago Higher Education Recruitment Consortium.

Career Talk

Dr. Kim's talk will include information on her research in particle physics, an explanation of her roles in particle physics outside of her own research, such as her current job as Deputy Director of Fermilab. She will highlight her growth into leadership roles.

Mildred Dresselhaus

Mildred Dresselhaus is an Institute Professor of Electrical Engineering and Physics at MIT. Her research over the years has covered a wide range of topics in Condensed Matter and Materials Physics. She is best known for her work on carbon science and carbon nanostructures. She is also one of the researchers responsible for the resurgence of the Thermoelectrics research field 15 years ago. She co-chaired a DOE Study on "Basic Research Needs for the Hydrogen Economy in 2003 and more recently co-chaired of a National Academy Decadal Study of Condensed Matter and Materials Physics. She served as Director of the DOE Office of Science toward the end of the Clinton Administration and as Chair of the as the Chair of the Governing Board of the American Institute of Physics 2003--2008. Professor Dresselhaus is a member of the National Academy of Sciences, the National Academy of Engineering, and has served as President of the American Physical Society, Treasurer of the National Academy of Sciences, President of the American Association for the Advancement of Science (AAAS), and on numerous advisory committees and councils. Dr. Dresselhaus has received numerous awards, including the US National Medal of Science and 24 honorary doctorates. Her recent awards include the L'Oreal-UNESCO 2007 North American Laureate for Women in Science, and the 2008 recipient of the Oersted Medal for Physics Education from the American Association for Physics Teachers and of the 2008 Buckley Prize for Condensed Matter Physics from the American Physical Society.

Why are we so excited about Carbon Nanostructures?

There is much current excitement about the interesting advances in science and the unusual physical properties of carbon nanostructures, particularly carbon nanotubes and graphene, which are both of great interest at the present time. A brief review will be given of the physical underpinnings of carbon nanostructures that were developed over the past 60 years, starting with the electronic structure and physical properties of graphene and graphite, and then moving to graphite intercalation compounds which contained the first carbon nanostructures to be studied experimentally. Liquid carbon studies were precursors to the fullerene family of nanostructures and vapor grown carbon fibers were precursors to carbon nanotubes. Particular emphasis is given to the recent developments in our understanding of the photophysics of carbon nanotubes and graphene, with perspectives on future research directions for these fields and applications that are emerging. As the talk is presented, reference will be made to the connection between the research I did and the career decisions I made because I was a women in physics.

Ayana Holloway Arce

Dr. Arce is a Chamberlain Postdoctoral Fellow at Lawrence Berkeley National Laboratory. She concentrates on experimental techniques to identify and measure the properties of heavy unstable particles such as the top quark, in order to search for unexpected interactions. She is currently involved in the preparation of the ATLAS experiment at the Large Hadron Collider.

Exploring LHC physics with ATLAS

Abstract: The Large Hadron Collider (LHC) is the biggest, most powerful, and probably best advertised particle collider ever made. It will eventually produce hundreds of millions of proton-proton collisions every second, precisely centered inside particle detectors such as the 7000 ton ATLAS detector. This talk will explain why the LHC project really deserves so much media attention, and how physicists are preparing ATLAS to observe tiny signals that would mean even bigger news.

About the Career Panelists

Aziza Baccouche

Dr. Baccouche is a physicist by training and currently works as a science media producer in affiliation with AZIZA Productions, her own media production company. She received her Ph.D. in theoretical nuclear physics from the University of Maryland at College Park in 2002. While in graduate school, she completed two short internships at CNN and at the Discovery Health Channel. From these internships, she gained hands-on experience producing science-based news segments and documentary films.

Among Baccouche's proudest productions is a short film titled the Changing Face & Image of Science—a film that profiles the achievements of six dynamic young African-American scientists. She is currently producing a biographical documentary titled Seeking Vision, a film that highlights the obstacles she has overcome to include loosing most of her sight as a child and having to undergo five brain operations.

After receiving her doctorate, Baccouche became a regular science producer and correspondent for Evening Exchange on Howard University Television, a PBS affiliate station. Hosted by veteran Washington DC journalist Kojo Nnamdi, Baccouche helped stimulate the on-air roundtable discussions with experts, and also produced five to ten minute-long video segments, which were broadcast before the roundtable discussions. Stories she produced include discussions regarding the benefits and drawbacks of genetically modified foods and the significance of the human genome project, among others.

Sarah C. Case

Sarah C. Case is an Associate Program Officer at the Board on Energy and Environmental Systems (BEES) of the National Research Council (NRC). Her work at the NRC has focused on technical and policy aspects of nuclear energy, the electric transmission and distribution systems, and domestic nuclear security issues (in conjunction with the Academies' Nuclear and Radiation Studies Board). Dr. Case came to the National Research Council as a Christine Mirzayan Science and Technology Policy Fellow shortly after completing her Ph.D. in September 2007, and joined the staff of BEES in December 2007. She received an A.B. in physics from Columbia University in 2000, and a Ph.D. in physics from the University of Chicago in 2007.

Bonnie Fleming

Bonnie Fleming is an assistant professor of physics at Yale University in the high energy physics group. Her neutrino-based research program stands at the crossroads of particle physics, nuclear physics, and astrophysics. Until recently, the neutrino, the tiniest of the building blocks of all matter, told us little about itself or about the rest of the universe. Only in the last ten years have convincing results shown the neutrino has mass. Her experimental research program

focuses on precision tracking experiments looking for unexpected properties of neutrino interactions.

Nitya Kallivayalil

Nitya received her Ph.D. from Harvard in the summer of 2007, working with Prof. Charles Alcock on the dynamics of satellite galaxies. She won the Fireman Fellowship Prize for her thesis entitled "The Motions of the Magellanic Clouds and the Nature of Galactic Dark Matter". She is broadly interested in using satellite galaxies in the Local Group to place constraints on the properties of their parent dark halos, and to understand the process of mass build-up in Milky Way-type galaxies. This is a fertile testing ground for dark matter theories. She has also worked on gravitational microlensing and has lead numerous campaigns aimed at deciphering the nature of the signal seen by microlensing surveys such as MACHO. She considers herself an optical and infrared astronomer and has used the Hubble, Spitzer, Magellan and MMT Telescopes in her work. She earned her BA in Physics, summa cum laude, from Mount Holyoke College in 2001 and is actively committed to the advancement of women in science.